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ISOTOPIC MASSES AND ABUNDANCES (LADC-285)

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This table contains the isotopic mass values which we consider most reliable. As can be seen from the given probable errors, the masses up to neon are very much more accurately known than for the heavier elements. The lighter masses were calculated, taking into account all of the more accurate data from mass spectrograph as well as disintegrations, and attempting the best possible fit.

Abbreviations used in the isotopic mass table:

For stable isotopes, the abundance is given in per cent. Radioactive elements are indicated by the particle they emit ($\beta-$ or $\beta+$); βc means that the nucleus captures an orbital electron but does not emit positrons. P means instability against disintegration into heavy nuclear particles. Mass values, in parenthesis, refer to nuclei which have not yet been produced.

The errors listed are meant to be about 3 times the probable or twice the standard error. For theoretical estimates, the error is usually not given.

Sources of the data are indicated as follows:

I–Calculations by Betty J. Isaacs, Cornell University, Master's Thesis, 1942.

W–Wigner, Memorandum No. 24, April 2, 1940.

B–Barkas, Phys. Rev. 55:691 (1939).

M–Mass spectrograph value (usually most reliable).

D–From disintegration experiments involving heavy particles from end-point of β-spectrum.

C–Calculated value.

corr–corrected in view of more recent accurate determination of the mass of a neighboring isotope, from which the mass of the given isotope is obtained through a disintegration measurement or a theoretical estimate.

E–Estimate.

* This is Section 19 of LA 11, Los Alamos Handbook of Nuclear Physics.

Z	Element	A	Abundance per cent	Mass	Error x 10^5	Source
0	N	1	$\beta-$	1.00893	3	ID
1	H	1	99.98	1.008123	0.6	IM
1	H	2	.02	2.014708	1.1	IM
1	H	3	$\beta-$	3.01702	3.4	ID
2	He	3	10^{-5}	3.01700	4	ID
2	He	4	100	4.00390	3	IM and D
2	He	5	P	5.0137	35	ID
2	He	6	$\beta-$	6.0209	50	Iβ
3	Li	5	P	(5.0136)	(60)	WC
3	Li	6	7.9	6.01697	5	ID
3	Li	7	92.1	7.01822	6	IM and D
3	Li	8	$\beta-$	8.02502	7	D
4	Be	6	$\beta+$	6.0219	(100)	WC
4	Be	7	Kc	7.01916	7	ID
4	Be	8	P	8.00785	7	ID
4	Be	9	100	9.01503	6	ID
4	Be	10	$\beta-$	10.01677	8	ID
4	Be	11	P	(11.0277)	-	WC
5	B	9	P	9.01620	7	ID
5	B	10	18.4	10.01618	9	IM and D
5	B	11	81.6	11.01284	8	IM and D
5	B	12	$\beta-$	12.0190	70	ID
5	B	13	$\beta-$	(13.0207)	-	WC
6	C	10	$\beta+$	10.0210	30	ID
6	C	11	$\beta+$	11.01495	9	ID
6	C	12	98.9	12.00382	4	IM
6	C	13	1.1	13.00751	10	IM and D
6	C	14	$\beta-$	14.00767	5	ID and β
6	C	15	$\beta-$	(15.0165)	-	WC
7	N	12	($\beta+$)	(12.0233)	-	WC
7	N	13	$\beta+$	13.00988	7	ID
7	N	14	99.62	14.00751	4	IM

Z	Element	A	Abundance per cent	Mass	Error x 10^5	Source
7	N	15	0.38	15.00489	21	IM
7	N	16	$\beta -$	> 16.0065 < 16.011	-	β ID
7	N	17	$\beta -$	(17.014)	-	WC
8	O	14	$\beta +$	(14.0131)	-	WC
8	O	15	$\beta +$	15.0078	40	Iβ
8	O	16	99.76	16.000000	-	Standard
8	O	17	0.04	17.00450	6	ID
8	O	18	0.20	18.0049	40	WM
8	O	19	$(\beta -)$	19.0139)	-	WC
9	F	16	$\beta +$	(16.0175)	-	WC
9	F	17	$\beta +$	17.0075	30	ID
9	F	18	$\beta +$	18.0065	60	WD
9	F	19	100	19.00450	26	IM
9	F	20	$\beta -$	>20.0042 <20.0092	- -	Iβ ID
9	F	21	$\beta -$	(21.0059)	-	WC
10	Ne	18	$\beta +$	(18.0114)	-	WC
10	Ne	19	$\beta +$	19.00781	20	Wβ
10	Ne	20	90.0	19.99877	10	IM
10	Ne	21	0.27	20.99963	22	IM
10	Ne	22	9.73	21.99844	36	IM
10	Ne	23	$\beta -$	(23.0013)	-	WC
11	Na	21	$\beta +$	(21.0035)	-	WC
11	Na	22	$\beta +$	21.9999	50	Iβ
11	Na	23	100	22.99618	31	ID
11	Na	24	$\beta -$	23.9975	45	ID
11	Na	25	$\beta -$	(24.9967)	-	WC
12	Mg	22	$\beta +$	(22.0062)	-	WC
12	Mg	23	$\beta +$	23.0002	40	Wβ
12	Mg	24	77.4	23.9924	60	Bβ
12	Mg	25	11.5	24.9938	90	WD
12	Mg	26	11.1	25.9898	50	WD

Z	Element	A	Abundance per cent	Mass	Error x 10^5	Source
12	Mg	27	$\beta-$	26.9928	150	Wβ
13	Al	25	$\beta+$	24.9981	100	Wβ
13	Al	26	$\beta+$	25.9929	150	Wβ
13	Al	27	100	26.9899	80	WD
13	Al	28	$\beta-$	27.9903	70	Wβ
13	Al	29	$\beta-$	28.9893	80	Wβ
13	Al	30	$\beta-$	(29.9954)	-	WC
14	Si	27	$\beta+$	26.9949	90	Iβ
14	Si	28	89.6	27.9866	60	WM
14	Si	29	6.2	28.9866	60	WM
14	Si	30	4.2	29.9832	90	WD
14	Si	31	$\beta-$	30.9862	60	Wβ
14	Si	32	$\beta-$	(31.9849)	-	WC
15	P	29	$\beta+$	(28.9919)	(100)	WC
15	P	30	$\beta+$	29.9873	100	Iβ
15	P	31	100	30.9843	50	WM
15	P	32	$\beta-$	31.9827	40	Iβ
15	P	33	$\beta-$	(32.9826)	-	WC
16	S	31	$\beta+$	(30.9899)	-	C
16	S	32	95.0	31.98089	7	IM
16	S	33	0.74	32.9800	60	W corr
16	S	34	4.2	33.97710	35	IM
16	S	35	$\beta-$	34.9788	80	W corr
16	S	36	0.016	35.978	100	W
17	Cl	33	$\beta+$	(32.9860)	-	WC corr
17	Cl	34	$\beta+$	33.9801	-	Iβ
17	Cl	35	75.4	34.97867	21	IM
17	Cl	36	βc	35.9788	100	W
17	Cl	37	24.6	36.97750	14	IM
17	Cl	38	$\beta-$	37.981	300	W
17	Cl	39	$\beta-$	(38.9794)	-	WC
18	A	35	$\beta+$	(34.9850)	-	C

Z	Element	A	Abundance per cent	Mass	Error x 10^5	Source
18	A	36	0.307	35.9780	100	W
18	A	37	βc	(36.9777)	-	E
18	A	38	0.061	37.974	250	ID
18	A	39	$\beta-$	(38.9755)		WC
18	A	40	99.63	39.9756	60	IM
18	A	41	$\beta-$	40.9770	60	W
19	K	37	$\beta+$	(36.9830)	-	WC
19	K	38	$\beta+$	(37.9795)	-	WC
19	K	39	93.3	(38.9747)	-	WC
19	K	40	0.012	39.9760	100	W
20	Ca	40	96.96	39.9753	150	E
20	Ca	42	0.64	41.9711	-	W
20	Ca	43	0.15	42.9723	-	W
20	Ca	44	2.06	-	-	-
20	Ca	45	$\beta-$	44.968	-	G
21	Sc	45	100	44.9669	-	ID
22	Ti	46	-	45.9661	100	IM
22	Ti	47	-	46.9647	100	IM
22	Ti	48	-	47.9631	50	IM
22	Ti	49	-	48.9646	60	IM
22	Ti	50	-	49.9621	40	IM
22	Ti	51	-	50.9587	100	W corr
23	V	51	-	50.9577	50	-
24	Cr	51	βc	50.958	-	W corr
24	Cr	52	81.6	51.956	-	W corr
24	Cr	53	10.4	52.956	-	W corr
25	Mn	55	100	54.957	-	E
26	Fe	54	6.04	53.957	-	W corr
26	Fe	56	91.57	55.9568	170	IM
26	Fe	57	2.11	56.957	-	W corr
26	Fe	58	0.28	-	-	-